

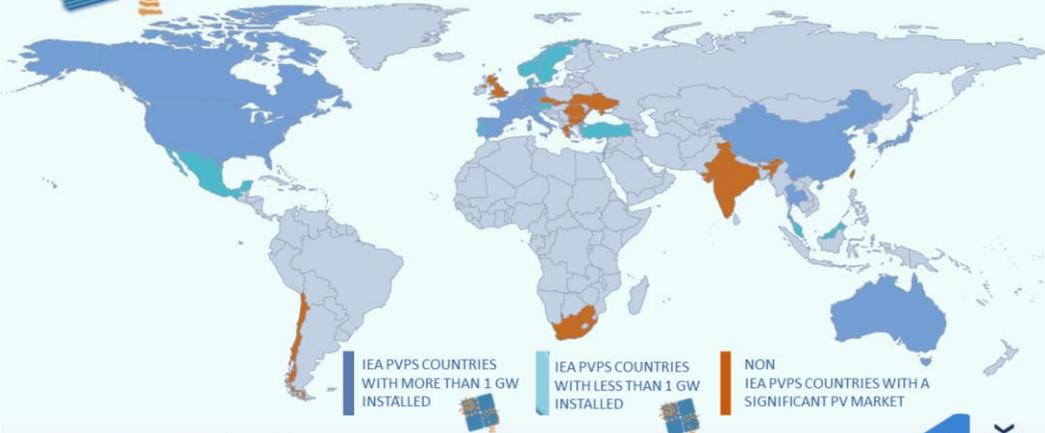
Solar PV Development in China



Wang Sicheng, ERI, NDRC

Jun. 15th, 2015, Manila

2014 Global PV Evolution



As of the end of 2014

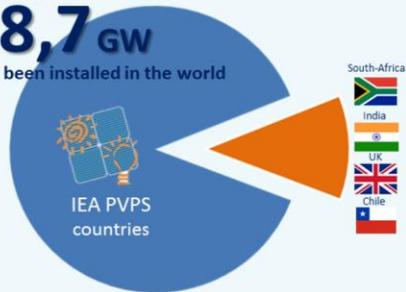
177 GW

Have been installed all over the world

and only in 2014

38,7 GW

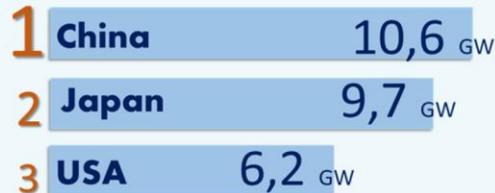
Have been installed in the world



1^{MARK} GW

20 countries have now passed the 1^{MARK} GW of cumulative PV systems capacity at the end of 2014 and 5 countries installed at least 1 GW in 2014 (compared to 9 in 2013).

IN 2014 THE TOP 3 WORLD COUNTRIES, WHICH ARE ALSO PART OF THE IEA PVPS PROGRAM WERE:



1%

OF THE WORLD ELECTRICITY GENERATION IS NOW COVERED WITH PV AND

19 COUNTRIES

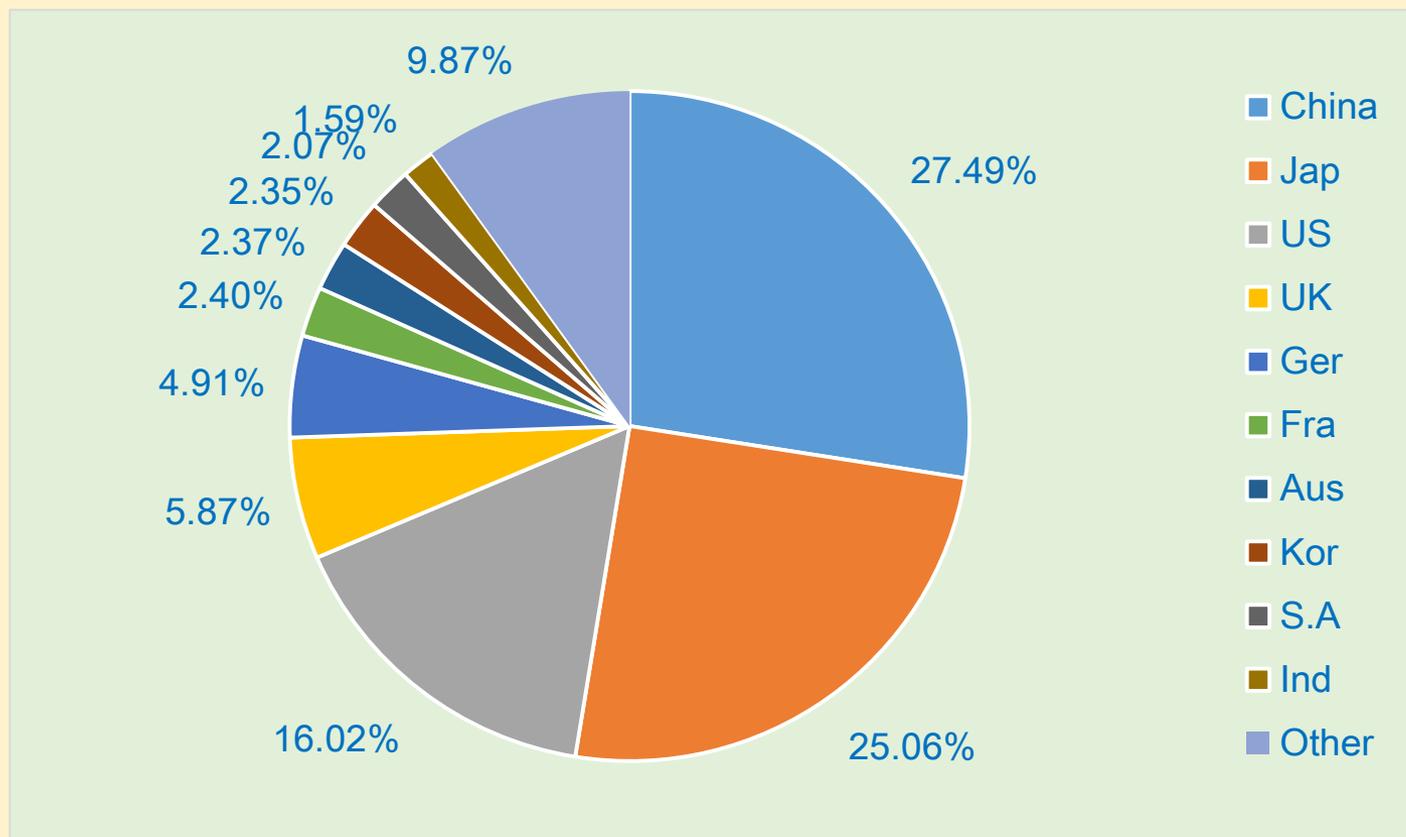
IN THE WORLD NOW HAVE AT LEAST ENOUGH PV TO COVER 1% OF THEIR ANNUAL ELECTRICITY DEMAND WITH PV.



World PV Market (2014)

Source: IEA PVPS 2015

World PV Annual Installation by Countries (2014)



Country	China	Jap	US	UK	Ger	Fra	Aus	Kor	S.A	Ind	Other	Total
2013 (GW)	9.50	6.90	4.50	1.70	3.30	0.60	1.20	0.44	0.30	0.44	9.47	38.35
2014 (GW)	10.64	9.70	6.20	2.27	1.90	0.93	0.92	0.91	0.80	0.62	3.82	38.70
2014 Share (%)	27.49	25.06	16.02	5.87	4.91	2.40	2.37	2.35	2.07	1.59	9.87	100.00
Cumulative (GW)	28.38	23.30	18.28	5.10	38.20	5.66	4.13	2.38	0.92	2.94	47.70	177.00

Source: IEA PVPS 2015

World PV Cumulative Installation by Countries (2014)

TABLE 1: TOP 10 COUNTRIES FOR INSTALLATIONS AND TOTAL INSTALLED CAPACITY IN 2014

	TOP 10 COUNTRIES IN 2014 FOR ANNUAL INSTALLED CAPACITY				TOP 10 COUNTRIES IN 2014 FOR CUMULATIVE INSTALLED CAPACITY			
1 st		China	10,6 GW		Germany	38,2 GW		
2 nd		Japan	9,7 GW		China	28,1 GW		
3 rd		USA	6,2 GW		Japan	23,3 GW		
4 th		UK	2,3 GW		Italy	18,5 GW		
5 th		Germany	1,9 GW		USA	18,3 GW		
6 th		France	0,9 GW		France	5,7 GW		
7 th		Australia	0,9 GW		Spain	5,4 GW		
8 th		Korea	0,9 GW		UK	5,1 GW		
9 th		South Africa	0,8 GW		Australia	4,1 GW		
10 th		India	0,6 GW		Belgium	3,1 GW		

NUMBERS HAVE BEEN ROUNDED

Source: IEA PVPS

PV Market in China

- **Rural Electrification**
- **Communication and Industry**
- **PV Commercial Products**
- **Building Integration PV**
- **Large Scale Ground Mounted PV**



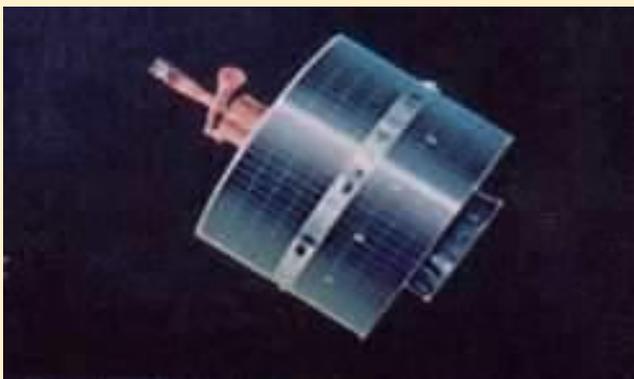
Rural Electrification (0.60%)



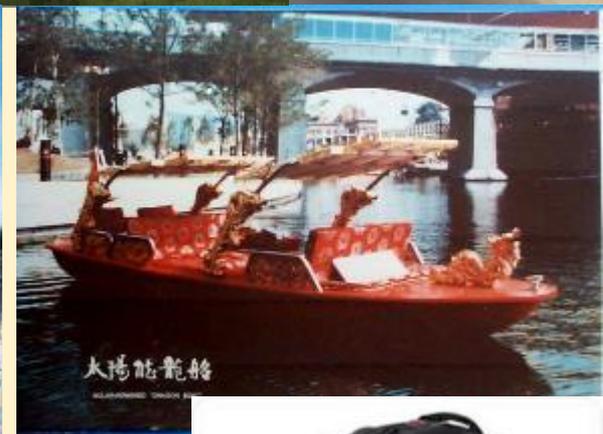
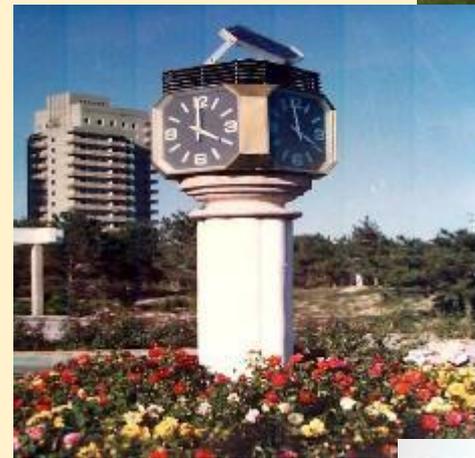
总装机容量50MW光伏电站设计单位2002.12

18 3.00

Communication & Industry Sector 0.28%

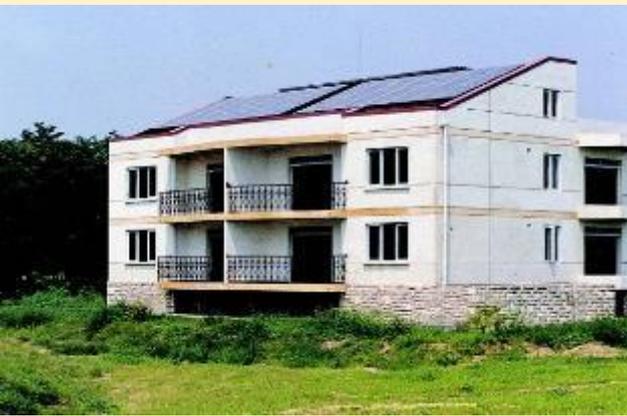


Solar Products 0.28%



PV Buildings BIPV&BAPV

16.46%



LS-PV in Gobi – Desert (82.38%)



Largest PV Power Plant in the World

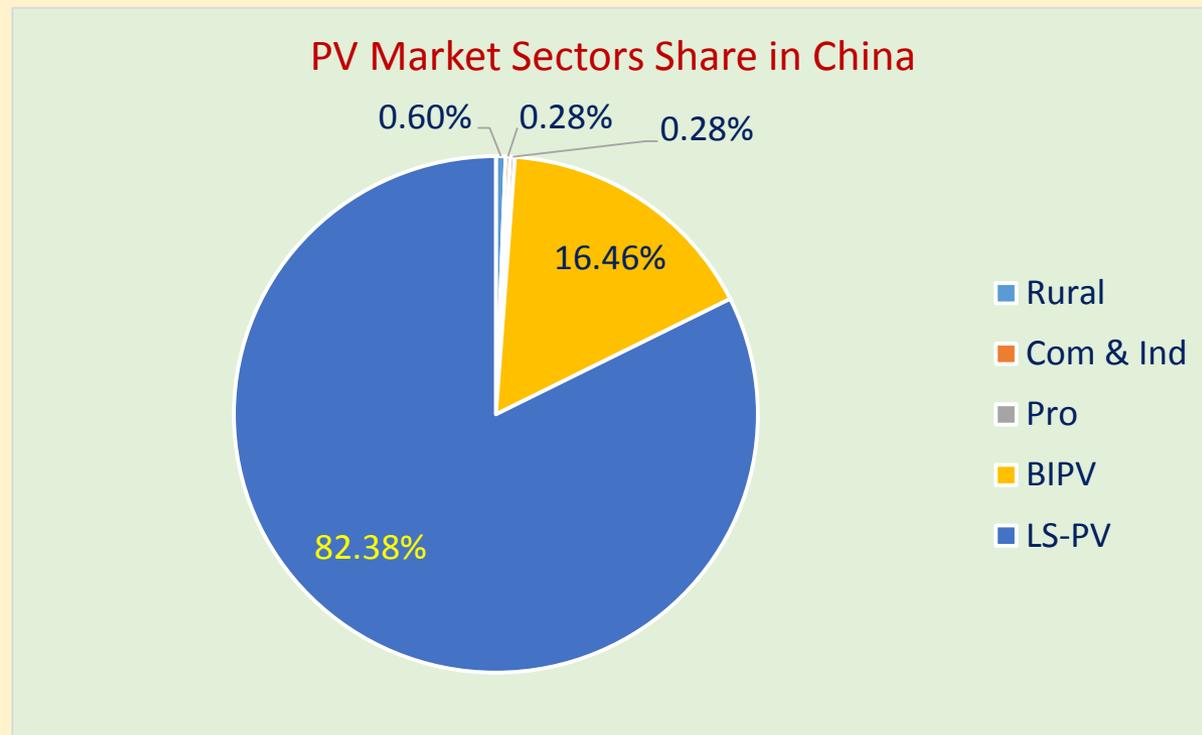


500MW PV Power Plant in Golmud, Qinghai, 2014-12-20
(Invested by Yellow River Power Co.)

2014 Domestic PV Market by Sectors

2014 Domestic PV Market by Sectors			
No.	Market Sector	Annu.Ins.	Cumm. Ins.
		(MWp)	(MWp)
1	Rural Electrification	20	170
2	Comm.& Indus.	10	80
3	PV Products	10	80
4	Building PV	2050	4670
5	Ground Mounted LS-PV	8550	23380
	Total	10640	28380

Source: National Energy Administration (NEA) , Feb. 15, 2015



2015 Domestic PV Market Forecast – 20GW?

附件 1:

2015 年光伏发电建设实施方案

序号	地区	2015 年新增光伏电站建设规模 (万千瓦)	备注
合计	全国	1780	
1	河北	120	其中 30 万千瓦专门用于光伏扶贫试点县的配套光伏电站项目
2	山西	65	其中 20 万千瓦专门用于光伏扶贫试点县的配套光伏电站项目
3	内蒙古	80	
4	辽宁	30	
5	吉林	30	
6	黑龙江	30	
7	江苏	100	
8	浙江	100	
9	安徽	100	其中 40 万千瓦专门用于光伏扶贫试点县的配套光伏电站项目
10	福建	40	
11	江西	60	
12	山东	80	
13	河南	60	
14	湖北	50	
15	湖南	40	
16	广东	90	
17	广西	35	
18	海南	20	
19	四川	60	
20	贵州	20	
21	云南	60	
22	陕西	80	
23	甘肃	50	其中 25 万千瓦专门用于光伏扶贫试点县的配套光伏电站项目
24	青海	100	其中 15 万千瓦专门用于光伏扶贫试点县的配套光伏电站项目
25	宁夏	100	其中 20 万千瓦专门用于光伏扶贫试点县的配套光伏电站项目
26	新疆	130	
	兵团	50	

注: 1、新增光伏电站建设规模包括集中式光伏电站和分布式光伏电站。
2、北京、天津、上海、重庆及西藏在不发生弃光的前提下, 不设建设规模上限。

国家能源局文件

国能新能〔2015〕73 号

国家能源局关于下达 2015 年 光伏发电建设实施方案的通知

各省(自治区、直辖市)发展改革委(能源局)、新疆生产建设兵团发展改革委,各派出机构,国家电网公司、南方电网公司,内蒙古电力公司、陕西地方电力公司,水电规划总院、电力规划总院:

根据光伏发电项目建设管理有关规定,综合考虑全国光伏发电发展规划、各地区 2014 年度建设情况、电力市场条件以及各方面意见,我局组织编制了 2015 年光伏发电建设实施方案。现将有关内容及要求通知如下:

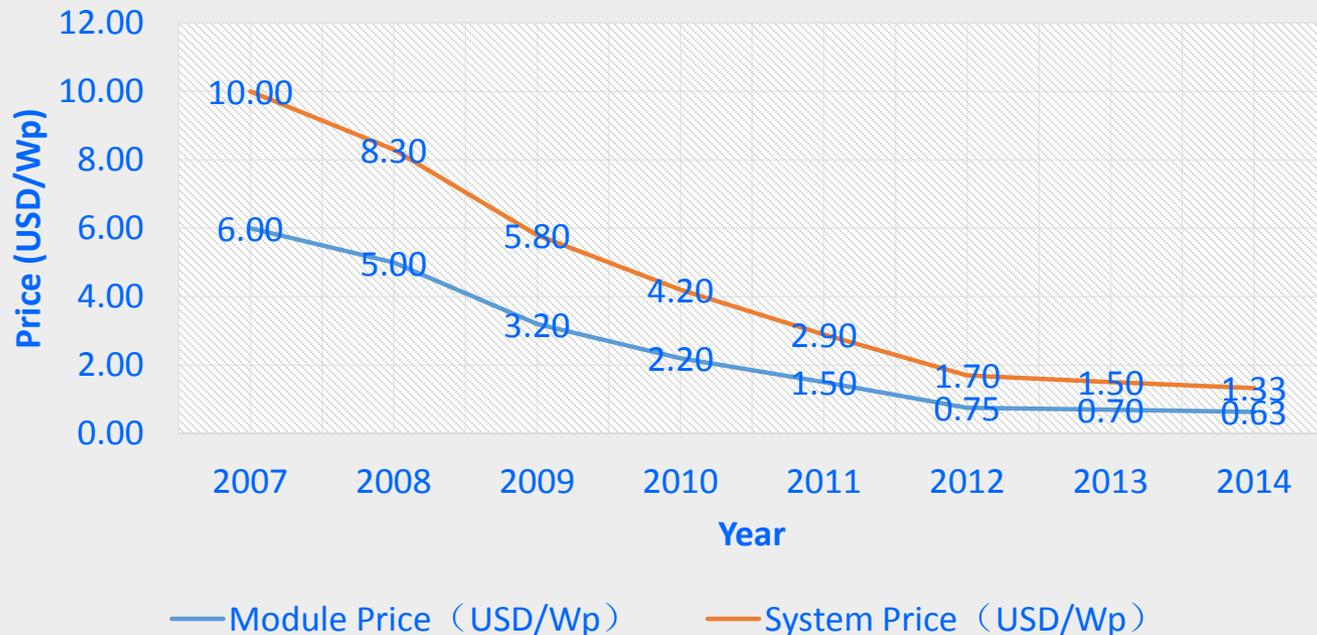
一、为稳定扩大光伏发电应用市场,2015 年下达全国新增光伏电站建设规模 1780 万千瓦。各地区 2015 年计划新开工的集中

— 1 —

1. Target 17.8GW (1.5GW for poverty alleviation);
2. PV Buildings and Self-Consumption projects no need of quota;
3. Quota will be distributed by competition.

PV Module and System Price Reduction

China PV Module and System Price 2007-2014



During Last 7 Years:

- **86.4% of module price decreased;**
- **86.7% of system price decreased;**
- **76.2% of PV FIT decreased**
- **4 Yuan/kWh was set for PV in 2008 (for the 1MW PV project in Shanghai).**

Year	2007	2008	2009	2010	2011	2012	2013	2014
Cumulative Installation (GWp)	0.10	0.14	0.30	0.80	3.20	6.70	16.28	26.84
Module Price (USD/Wp)	6.00	5.00	3.20	2.20	1.50	0.75	0.70	0.63
System Price (USD/Wp)	10.00	8.30	5.80	4.20	2.90	1.70	1.50	1.33
Feed-In Tariff of PV (Yuan/kWh)	4.0	Set through Bidding			1.15	1.00	0.9-1.0	0.9-1.0

PV Incentive Policies

Released by NDRC on Aug. 26, 2013: NDRC [2013] No.1638

Solar Resources	FIT for LS-PV	Self-Consumption for Distributed PV	
	FIT (Yuan/kWh)	For self-consumed PV (Yuan/kWh)	Excess PV Feed-Back to Grid (Yuan/kWh)
I	0.90 (¢0.145)	Retail Price of Grid Electricity+0.42 Yuan (+ ¢0.068)	Whole-sell Coal-Fire Tariff + 0.42 Yuan (+ ¢0.068)
II	0.95 (¢0.153)		
III	1.00 (¢0.161)		

Key Points:

- (1) 3 level of FIT for LS-PV based on local solar resources;
- (2) For distributed PV, 0.42 Yuan/kWh will be subsidized to PV electricity;
- (4) Subsidy duration: 20 Years;
- (5) PV developers can choose either FIT or Self-Consumption.

The subsidy money is come from the surcharge, which is 1.5 cents/kWh charge to the end users. About 60 billion Yuan (\$10 billion USD) per year can be collected to support RE power supply.

《NEA New Policies for Distribution PV》

NEA [2014] No. 514

- 1) The developers can **freely choose** either the policy for distribution PV (self-consumption), or the policy for LS-PV (FIT);
- 2) The developers can build “**distribution PV plants**” at un-used and discarded land, rooftop of green-houses, on fishing pools or surface of lakes, etc.;
- 3) **No quota limitation** for the self-consumption projects and the projects at approved demonstration zones;
- 4) To simplify the process of **projects registration and grid-connection**;

Rural Urbanization Progress

New Working Style



From working in
farmland to working in
greenhouse



New Living Style



From old houses
move to new
buildings



Innovative Business Model for PV



Green House Covered by PV

PV-Fish Pool



PV- Vegetable Field



PV- Farm Land



PV Tunnel – Railway & Highway



PV Poverty Alleviation Project

NEA [2014] No.420、495

国家能源局

关于转发光伏扶贫试点实施方案编制大纲的函

河北、山西、内蒙古、安徽、云南、甘肃、青海、宁夏、新疆省（自治区）发展和改革委员会（能源局）、扶贫办，各派出机构，水电水利规划设计总院：

为做好光伏扶贫试点工作，现将水电水利规划设计总院《关于印发光伏扶贫实施方案编制大纲（试行）的函》予以转发，请参照完善本区域光伏扶贫试点实施方案，有关意见或建议请反馈至水电水利规划设计总院。

附件：水电水利规划设计总院《关于印发光伏扶贫实施方案编制大纲（试行）的函》



水电水利规划设计总院
China Renewable Energy Engineering Institute

关于印发光伏扶贫实施方案编制大纲 (试行)的函

各有关单位：

根据《国家能源局 国务院扶贫办关于印发实施光伏扶贫工程工作方案的通知》（国能新能〔2014〕420号）和《国家能源局 国务院扶贫办关于组织开展光伏扶贫工程试点工作的通知》（国能新能〔2014〕495号）文件要求，我院开展技术支撑工作，负责光伏扶贫全过程技术服务，细化光伏扶贫试点实施方案编制内容，在整个工程实施及政策协调中提供相关技术服务和指导，并逐步制定工程技术规范、开展工程质量控制、建立项目信息系统。

为进一步推进光伏扶贫试点工作，现将光伏扶贫试点实施方案编制大纲（试行）印发你单位，供工作中参照执行，执行过程中的意见或建议反馈至我院。

联系人：

秦潇 010-51973148, 13810969901@139.com。

附件1：XX省（区）光伏扶贫试点实施方案编制大纲（试行）

附件2：XX县光伏扶贫试点实施方案编制大纲（试行）



PV Poverty Alleviation Project

NEA [2014] No.420、495

Poverty line of United Nations is **1 USD per day**, China has about **150 million people** under this line.

Poverty Alleviation project is to install **3KW** of PV for each poor family and total is **1.5GW** for about **500,000 families**.

70% of capital cost will be subsidized by **central and local governments**.

To provide money source to the poor families.



Home PV Sys.: **3000Wp**, **16000 Yuan** from government subsidy; **6000 Yuan** of loan from Bank and **2000 Yuan** by self. Totally **24000 Yuan/set**.

Daily average generation **10kWh** and annually **3600kWh**. Annual income of each family is about **3600 Yuan**.



**In Next 5 years, China plan to build 30-50
Micro-Grid Demonstration Projects**

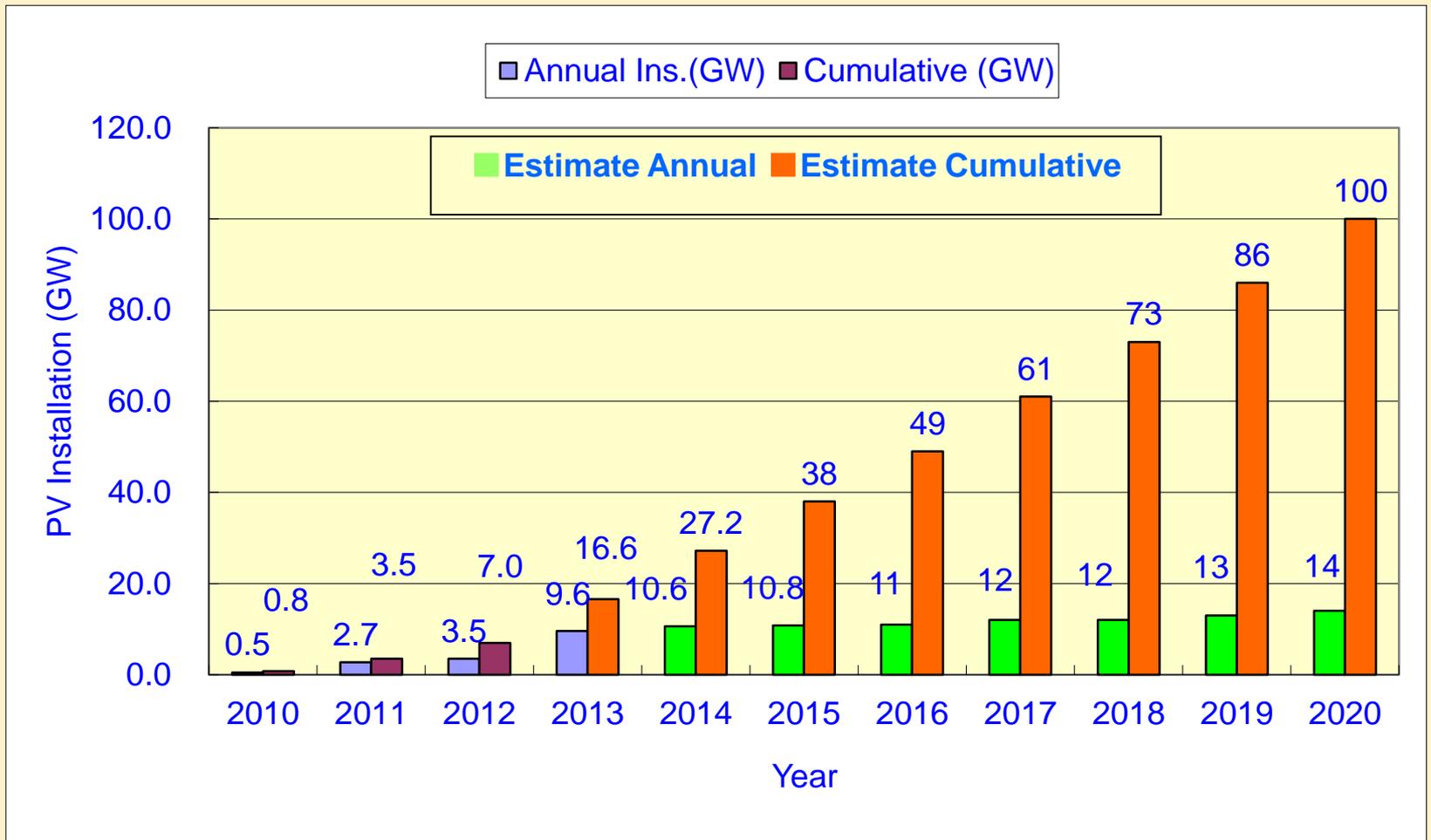
To reach the following purposes:

- ◆ ***Technology and Equipment***
- ◆ ***Relationship with Utility Grid and High-penetration of RE (50%)***
- ◆ ***Economics and Incentives***
- ◆ ***Institutional Innovation and Mechanisms***

Financing Issues

- 1) For **large-scale PV projects**, the developers are mostly **state owned big companies** who can easily get loan from Banks. So, there is less problem on financing for large PV power projects;
- 2) **Distributed PV projects** are facing problems of Financing. The developers who are doing distributed PV are almost **medium and small companies** who have limited equity and difficult to get loan from Banks;
- 3) The rules of issuing loan by Banks are **based on equity** of the lenders, **not based on PV project itself or cash flow**. So, the medium and small sized companies are difficult to get capital financing;
- 4) Chinese **government** now encourage Banks to give priority to RE projects in financing .

Domestic PV Market Forecast



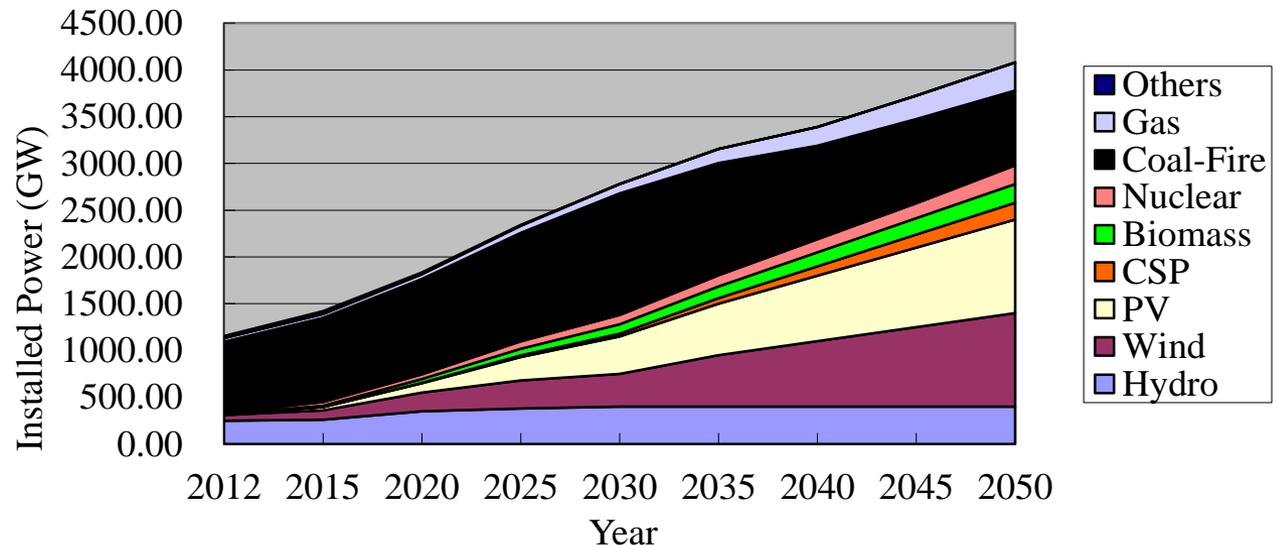
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Annual Ins.(GW)	0.5	2.7	3.5	9.6	10.6	10.8	11	12	12	13	14
Cumulative (GW)	0.8	3.5	7.0	16.6	27.2	38	49	61	73	86	100

Source: PV Roadmap 2020,2030,2050, China Renewable Energy Society

Installed Capacity of Power Sectors 2020-2050 (GW)

Power Source	2012	2015	2020	2025	2030	2035	2040	2045	2050
Hydro	249.00	260	350	380	400	400	400	400	400
Wind	60.83	100	200	300	350	550	700	850	1000
PV	7.00	35	100	250	400	550	700	850	1000
CSP	0.01	1	5	18	30	60	100	140	180
Biomass	6.00	13	40	70	100	125	150	175	200
Nuclear	13.00	40	50	80	100	120	140	160	200
Coal-Fire	758.00	900	1020	1160	1300	1200	1000	900	800
Gas	38.00	40	50	75	100	150	200	250	300
Others	23.00	32	20	10					
Total	1154.84	1421	1835	2343	2780	3155	3390	3725	4080
Non-Fossil-Fueles Share (%)	29.08	31.60	40.60	46.86	49.64	57.21	64.60	69.13	73.04
RE Power Share (%)	27.96	28.78	37.87	43.45	46.04	53.41	60.47	64.83	68.14
PV Share (%)	0.61	2.46	5.45	10.67	14.39	17.43	20.65	22.82	24.51

By 2050, the total power capacity is estimated to 4080GW and Installed PV capacity will be 1000 GW, the share of PV will be 24.51%.

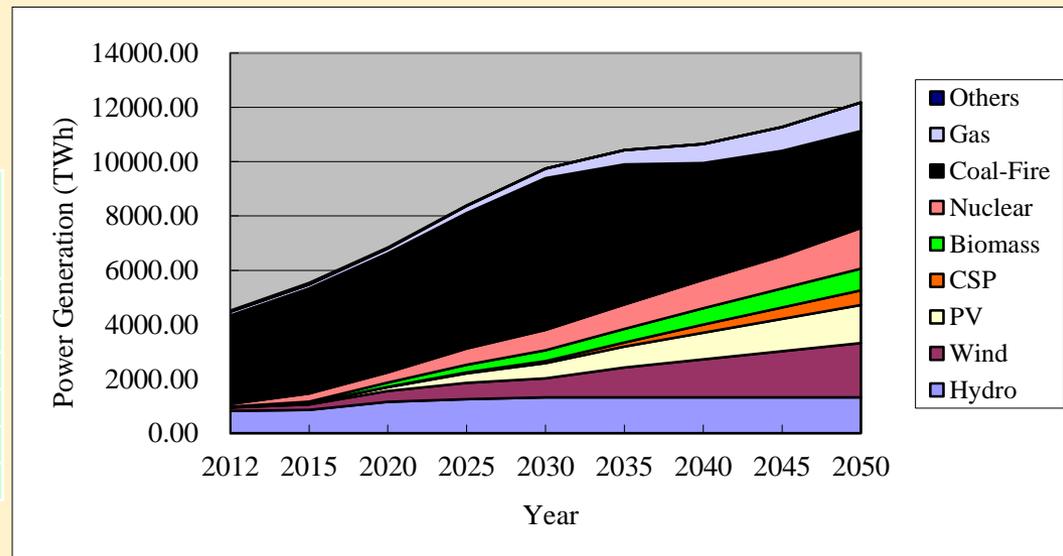


The Power Generation by Sectors 2020-2050 (TWh)

Power Source	2012	2015	2020	2025	2030	2035	2040	2045	2050
Hydro	821.70	858	1155	1254	1320	1320	1320	1320	1320
Wind	121.66	200	400	600	700	1100	1400	1700	2000
PV	9.80	49	140	350	560	770	980	1190	1400
CSP	0.02	2	10	36	75	150	300	420	540
Biomass	24.00	52	160	280	400	500	600	700	800
Nuclear	97.50	300	375	600	750	900	1050	1200	1500
Coal-Fire	3259.40	3870	4386	4988	5590	5160	4300	3870	3568
Gas	133.00	140	175	263	350	525	700	875	1050
Others	46.00	64	40	20					
Total	4513.08	5535	6841	8391	9745	10425	10650	11275	12178
Non-Fossil-Fueles Share (%)	23.81	26.40	32.74	37.18	39.05	45.47	53.05	57.92	62.08
RE Power Share (%)	21.65	20.98	27.26	30.03	31.35	36.83	43.19	47.27	49.76
PV Share (%)	0.22	0.89	2.05	4.17	5.75	7.39	9.20	10.55	11.50

By 2050, the share of coal-fire electricity will be decreased from 72.43% of today to 29.73%.

Year	Coal-Fire Capacity (GW)	Generation (TWh)	Total Demand (TWh)	Share of Coal-Fire (%)
2012	758	3259	4500	72.43
2015	900	3870	5500	70.36
2020	1020	4386	6991	62.74
2030	1300	5590	9670	57.81
2040	1000	4300	10070	42.70
2050	800	3568	12000	29.73



China Now is Facing Pressure in Energy Supply and GHG Emission



Serious Air Pollution

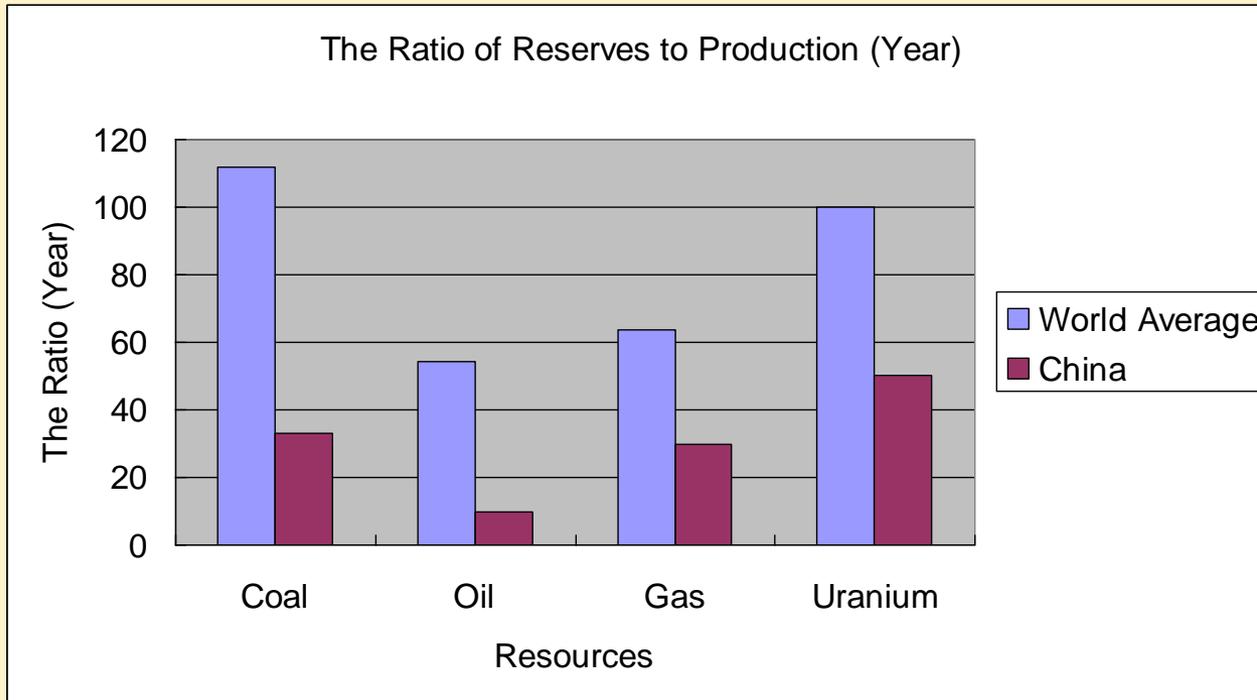
Dirty Fog in Beijing



China is Facing Serious Problems in Energy Supply and Air Pollution

- 1、 The largest country in GHG emission since 2007;
- 2、 The Largest country in energy consumption;
- 2、 The largest producer and consumer of electricity;
- 3、 The largest importer and user of coal;
- 4、 The largest importer of oil and 60% of oil was imported from other countries;
- 5、 Serious shortage in energy supply and serious pollution in environment.

The Ratio of Reserves to Production of China



In another 30 years, there will be no coal, no oil and no gas in China!

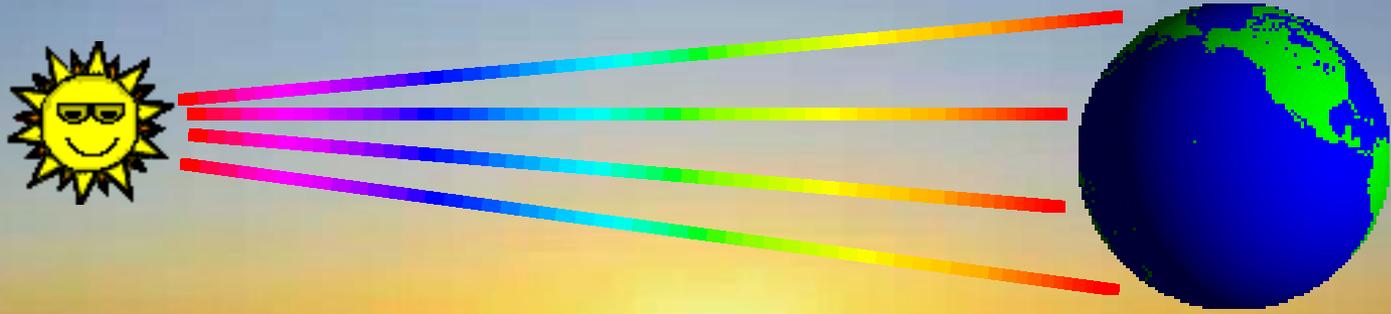
China must complete the transforming of energy structure within next 20-30 years, and based on solar and other RE.

Reserves	Coal	Oil	Gas	Uranium
World	112	54.2	63.6	100
China	31	11.9	29.0	50

Latest Chinese Government Promise

On Nov. 12th, 2014, China and US reach to a historic climate change agreement. China promise to peak its carbon emissions by 2030 and will also aim to get 20% of non-fossil fuel energy in total energy consumption.

To reach 20% target, non-fossil fuel energy must contribute 1.2 billion Tce. By 2030 hydro-power will be 400GW, Nuclear power 150GW, wind power 400GW and PV 600GW. From now about 38GW annual PV installation is required!



Thank You! Question?

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